

National Marine Fisheries Service
Southwest Fisheries Science Center
Santa Cruz Laboratory
110 Shaffer Road
Santa Cruz, California 95060

August 20, 2001 F/SWC3:KAB

CRUISE REPORT

VESSEL: NOAA R/V DAVID STARR JORDAN, DS 01-03

CRUISE DATES: MAY 9- JUNE 13, 2001

PROJECT: Rockfish recruitment assessment, Groundfish
Population Analysis Team, SWFSC - Santa Cruz, CA

ITINERARY: LEG I: May 9 - May 28. Departed MARFAC on May 9. Scientists Ken Baltz and Dale Roberts embarked the Ship May 7. Teacher at Sea participant, Janice Hersch, embarked the Ship May 8. Baltz and Roberts spent Monday, May 7 and Tuesday, May 8 transporting scientific equipment from Tiburon/Santa Cruz and staging it aboard the Jordan. Embarked remaining scientists and equipment via skiff at Monterey Harbor on May 11. Spent the majority of daylight hours of May 11 conducting an EK 500 bio-acoustic survey of Monterey Bay. Beginning the night of May 11 and ending the morning of May 25 the Ship and scientists conducted a juvenile rockfish survey between Cypress Point (Monterey County) and Point Reyes (Marin County). The survey completed 2 of 3 planned sweeps of the sampling area. Disembarked one scientist and embarked one scientist and a Ship's Officer at Monterey Harbor via small boat on the May 19. From May 25 to May 28 a physical oceanographic and acoustic survey of the Bodega Eddy region was conducted. Returned to Pier 27 in San Francisco in morning of May 28. One day in port on May 29.

LEG II: May 30 - June 11. Embarked scientists on May 30, departing at 1000. Continued with third

sweep of juvenile rockfish survey. Disembarked three scientists and embarked two scientists via small boat at Drake's Bay on June 6. Docked at Pier 32, San Francisco at 0730 on June 9 following completion of sweep 3 of the juvenile rockfish survey and calibration of the Simrad EK500 echosounder. Disembarked scientists, frozen samples from Pier 32. Ship departed Pier 32 at 1030 on June 9 and returned to San Diego on June 11.

OBJECTIVES:

1. To determine the distribution and abundance of pelagic juvenile rockfish between Cypress Pt. and Pt. Reyes, CA and their relationship with oceanographic conditions (temperature, salinity, currents, etc.).
2. To characterize the micronekton associated with prominent physical and oceanographic features.
3. To determine the location and physical oceanographic conditions of the persistent eddy/meander off Bodega, CA during the height of the upwelling season.
4. To observe seabird and marine mammal distribution and abundance between Cypress Pt. and Pt. Reyes, CA.
5. To collect juvenile salmon within the Gulf of the Farallones for genetic studies.

METHODS:

1. Juvenile Rockfish Survey: Three sweeps of the area were made. Five to seven midwater trawls of 15 minute duration were conducted each night along seven transects. A Stauffer-modified midwater trawl with an 86' headrope and 1/2" codend was used to obtain samples of juvenile rockfish. Ship speed through the water was maintained at ca 2.0 kt while trawling. Trawling operations commenced at dusk and concluded at dawn. Target headrope depths were 7, 30 and 100 meters. The majority of the trawls targeted a headrope depth of 30 meters. A Vemco Temperature-Depth-Recorder was placed on the trawl net's headrope during each tow to record depth and temperature.

CTD casts were made throughout the day in the vicinity of the trawl transects and at each trawl station at night. The CTD was lowered to a maximum depth of 500 m, as bottom depth allowed. Deployment rate: held 2 minutes near the surface, then 45 m/min. Retrieval rate: 60 m/min. Water samples were periodically collected for fluorometry calibrations and nutrient analysis.

ADCP, EK500, and Thermosalinometer data recordings were made continuously during the juvenile rockfish survey. Figure 1 illustrates the survey's standard trawl and CTD stations.

2. Bodega Eddy Survey: An ADCP, EK500 echosounder, thermosalinometer, and CTD were used to map the hydrographic conditions, currents and micronekton in the vicinity of the climatic position of the anticyclonic Bodega Eddy following the completion of the second sweep of the juvenile rockfish survey.

3. Acoustic Survey: Acoustic data were collected continuously throughout the cruise using a Simrad EK500 multi-frequency echo sounder. Targeted acoustic surveys of Monterey Bay and Cordell Bank were also performed. The echo sounder was configured with down-looking 38, 120, and 200 kilohertz (kHz) transducers mounted in the hull. A system calibration using standard sphere techniques was conducted while the Ship was anchored in Drake's Bay at the conclusion of Sweep 3. During the survey, the EK500 was configured to transmit pulses every 2 seconds at 1 kilowatt for 1 millisecond duration. Geographic positions were obtained from the ship's GPS and logged every 60 seconds. Ethernet communications were maintained between the EK500 and a Windows NT workstation which logged the EK500 telegrams using EchoLog software. Data were analyzed and displayed in the lab using Sonardata's EchoView

software.

4. Juvenile Salmon. Midwater trawls were conducted at night to collect juvenile salmon concurrent with the juvenile rockfish midwater trawls.

5. Ornithologists that were aboard during sweeps 1, 2, and 3 estimated the distribution and abundance of seabirds and marine mammals while underway.

Results:

1. Juvenile Rockfish Survey.

A total of 123 midwater trawls were conducted at night during the three sweeps. We observed the highest catch of juvenile rockfish since 1993. Numbers and sizes of the juvenile rockfish were much higher than what was observed in the previous 7 years. This goes against the trend of low abundance seen in recent years and may indicate a strong 2001 year class. Diversity of juvenile rockfish caught was also higher than in the previous seven years. A bloom of phytoplankton within the sampling area was noticeable during sweep one.

Two hundred forty-three CTD casts were made during the three sweeps.

Table 1 lists the species of juvenile rockfish caught during the cruise and on previous cruises since 1986.

Figure 1 illustrates the standard midwater trawl and CTD stations during the juvenile rockfish survey. Each station was sampled once per sweep.

2. Bodega Eddy Survey.

The Bodega Eddy Survey focused on using hydrographic and acoustic sampling methods to map the distribution of biomass and the associated current fields. The equipment used included a Simrad EK500 echosounder, an Acoustic Doppler Current Profiler (ADCP), a hull mounted thermosalinometer, and a CTD. Thirty CTD deployments were completed in the area between Pt. Arena and Cordell Bank and out to 70nm offshore (Fig 2). The EK500, ADCP, and thermosalinometer operated continuously during the eddy survey.

3. Hydroacoustic Survey.

Acoustic data were collected continuously and successfully throughout the cruise using the Simrad EK500. Targeted acoustic surveys were conducted within Monterey Bay before sweep 1 and over Cordell Bank after sweep 2. Monterey Bay was acoustically surveyed for approximately 12 hours on May 11. On May 27 upon concluding sweep 2 and the Bodega Eddy Survey the Ship transited to Cordell Bank and conducted 2 consecutive EK500 surveys (one daylight survey and one dusk/nighttime survey).

Approximately 10 gigabytes of data were collected during the cruise. The data are being used to for various studies including: 1) acoustic target identification and differentiation, 2:) concordance of bird sightings with zooplankton prey fields. The zooplankton field for sweep 3 has been mapped (Figure 3) and preliminary analyses indicate increased activity of Cassin's auklets in regions of high acoustic backscatter.

4. Juvenile salmon.

Twelve juvenile salmonids were collected from 6 midwater trawl hauls and frozen in the ultracold freezer.

5. Seabird and marine mammal observations.

During Sweeps 1 and 2 trained observers from Point Reyes Observatory used standardized population censusing techniques to survey the distribution and abundance of marine birds and cetaceans. Observers censused birds continuously during all daylight hours while the vessel was underway at speeds of 7 knots (9 km /h) or greater. A range-finder was used to estimate the width of the survey transect and only those birds sighted within a 300 meter arc from the bow (directly ahead) to 90 ° off the side with best visibility (e.g., least glare) were logged into a field computer. Ship-following birds were recorded the first time they were detected and were ignored thereafter. The observers estimated the range to cetacean sightings and recorded them, regardless of their perpendicular distance to the vessel. Here we provide a summary of seabird and cetacean observations during DS0103 sweeps 1 and 2.

Seabird and cetacean surveys covered a study area extending northwards from Monterey Bay to Point Arena (300 km), and across the shelf and the slope (80 km). This area was surveyed on two occasions: between May 11-17 (sweep 1) and from May 20 - 24

(sweep 2). Three additional days (May 25 - 27) were devoted to survey a warm-core eddy northwest of Point Reyes. Overall, 621 cetaceans and over 15,700 birds were recorded during 17 days and over 1700 km of survey effort. These surveys revealed species assemblages associated with coastal (< 50 m depth), shelf (50 - 200 m depth), slope (200 - 3000m depth) and pelagic (> 3000 m depth) waters similar to the ones described during the previous year. Common murres (30% of all birds sighted), sooty shearwaters (16% of total), western gulls (15% of total), and Brandt's cormorants (12% of total) were the numerically-dominant seabirds nearshore. Additionally, sooty shearwaters and red / red-necked phalaropes (*Phalaropus spp.*), and Pacific white-sided (*Lagenorhynchus obliquidens*) and Risso's (*Grampus griseus*) dolphins were the most numerous seabirds and cetaceans within Monterey Bay. Sooty shearwaters, and Cassin's auklets were the most abundant seabirds within the continental shelf, and black-footed albatrosses and fulmars were most numerous along the slope. However, the composition of the avifauna within the shelf-slope shifted between the first and the second sweeps, suggesting a change in the hydrographic conditions. During the first sweep, sooty shearwaters, common murres, red and red-necked phalaropes, and Cassin's auklets were aggregated along the shelf and slope between Monterey Bay and Cordell Bank. Together, these species accounted for 82% of all birds sighted. Additionally, large numbers of humpback whales and Dall's porpoises occurred within this region. Farther offshore, northern fulmars (*Fulmarus glacialis*) and black-footed albatrosses joined the sooty shearwater (66% of total birds) and the phalaropes (23% of all birds) as the numerically-dominant species in slope waters, accounting respectively for 3% of all birds sighted. Pacific white-sided dolphins were the numerically-dominant cetaceans along the continental slope. We encountered different conditions during the second sweep (May 20 - 24). The avifauna consisted of sooty shearwaters, (accounting for 80% of all birds sighted), phalaropes, western gulls, and common murres. The white-sided dolphin replaced the Dall's porpoise as the most commonly-sighted cetacean within shelf waters. Farther offshore, sooty shearwaters, Cassin's auklets, pink-footed shearwaters, and black-footed albatrosses were the most abundant seabirds along the slope. Many cetaceans were sighted along the continental slope, including Dall's porpoises, humpback whales, Risso's dolphins and white-sided dolphins.

Finally, during May 25-26 we conducted an opportunistic survey of a warm-core eddy, extending across the shelf and the

continental slope to the north of the study area previously surveyed. This survey revealed an avifauna more characteristic of pelagic waters, with numerous black-footed albatrosses and northern fulmars, and the occasional forked-tailed storm petrel (*Oceanodroma furcata*). Most noteworthy were seven Murphy's petrels (*Pterodroma ultima*). White-sided dolphins and harbor porpoises were the cetacean species most commonly sighted during in this region.

During Sweep 3 observers from Moss Landing Marine Laboratory used standardized population censusing techniques to survey the distribution and abundance of marine birds and cetaceans. During Sweep 3 of the juvenile rockfish survey a total of 20 species of seabirds were identified. Of the total number of birds counted (4477), 60% were shearwaters (2722), 18% were common murrelets (822), 11% were Cassin's auklets (521), 4% were western gulls (185), 2.3% were northern fulmars (69), 1% were pink-footed shearwaters (59), and 0.8% were black-footed albatross (40). We also had one sighting of six Arctic terns, one sighting of two ashy storm petrels, 3 sightings (one each) of brown pelicans, one tufted puffin, two sightings of 11 rhinoceros auklets, two sightings of eight Sabine's gulls, one sighting of two ancient murrelets, two sightings of three red-necked phalaropes, one sighting of four pigeon guillemots, one sighting of four Brandt's cormorants, and two sightings of seven double-crested cormorants.

We identified seven species of marine mammals and of the total number of mammals counted (930), 86% were Pacific white-sided dolphins (799), 6% were California sea lions (56), 3.2% were Risso's dolphins (30), 2.7% were humpback whales (25), and 1.6% were northern right whale dolphins. We also had one sighting of an unidentified whale, and one sighting of one elephant seal.

DISPOSITION OF DATA:

1. Juvenile rockfish specimens, CTD, EK500, thermosalinometer, ADCP data and profiles - Dale Roberts, NOAA NMFS, 110 Shaffer Road, Santa Cruz CA 94920

2. Juvenile salmon specimens and data - Bruce MacFarlane, NOAA NMFS, 110 Shaffer Road, Santa Cruz, CA 95060

3. Seabird and marine mammal data (Sweeps 1 and 2) - Bill Sydeman, Point Reyes Bird Observatory, 4990 Shoreline Hwy Stinson Beach, CA 94970; (Sweep 3) Sarah Allen, Point Reyes National Seashore, 1 Bear Valley Road, Pt Reyes, Ca 94956 or Carol Keiper, Moss Landing Marine Lab, Moss Landing, CA.

SCIENTIFIC PERSONNEL:

Leg I (May 9 - May 28)

Ken Baltz, Oceanographer, NMFS-Santa Cruz, CA (Cruise Leader)
Dale Roberts, Research Fish Biologist, NMFS-Santa Cruz, CA
Tom Laidig, Research Fish Biologist, NMFS-Santa Cruz, CA
Don Pearson, Research Fish Biologist, NMFS-Santa Cruz, CA
Heidi Fish, Research Fish Biologist, NMFS-Santa Cruz, CA
Eric Bjorkstedt, Research Fish Biologist, NMFS-Santa Cruz, CA
Janice Hersch, Teacher at Sea, Seattle, WA
Cornelia Oedekoven, Ornithologist, PRBO - Stinson Beach, CA
Sophie Webb, Ornithologist, PRBO - Stinson Beach, CA

Leg II (May 30 - June 11)

Steve Ralston, Res Fish Biol, NMFS-Santa Cruz, CA (Chief Sci)
Ken Baltz, Oceanographer, NMFS-Santa Cruz, CA (Cruise Leader)
Dale Roberts, Research Fish Biologist, NMFS-Santa Cruz, CA
Don Pearson, Research Fish Biologist, NMFS-Santa Cruz, CA
Eric Bjorkstedt, Research Fish Biologist, NMFS-Santa Cruz, CA
Steve Gough, Research Fish Biologist, NMFS-Santa Cruz, CA
Janice Hersch, Teacher at Sea, Seattle, WA
Jennifer Saltzman, Gulf of Farallones NMS, San Francisco, CA
Michael Carver, Cordell Bank NMS, Olema, CA
Carol Keiper, Ornithologist, MLML-Moss Landing, CA
Hannah Nevins, Ornithologist, MLML-Moss Landing, CA

DATE: _____

PREPARED BY: _____

Ken Baltz, Oceanographer
Santa Cruz Laboratory, SWFSC, NMFS

DATE: _____

APPROVED BY: _____

Churchill Grimes, Director
Santa Cruz Laboratory, SWFSC, NMFS

Standard Trawl and CTD Station Locations

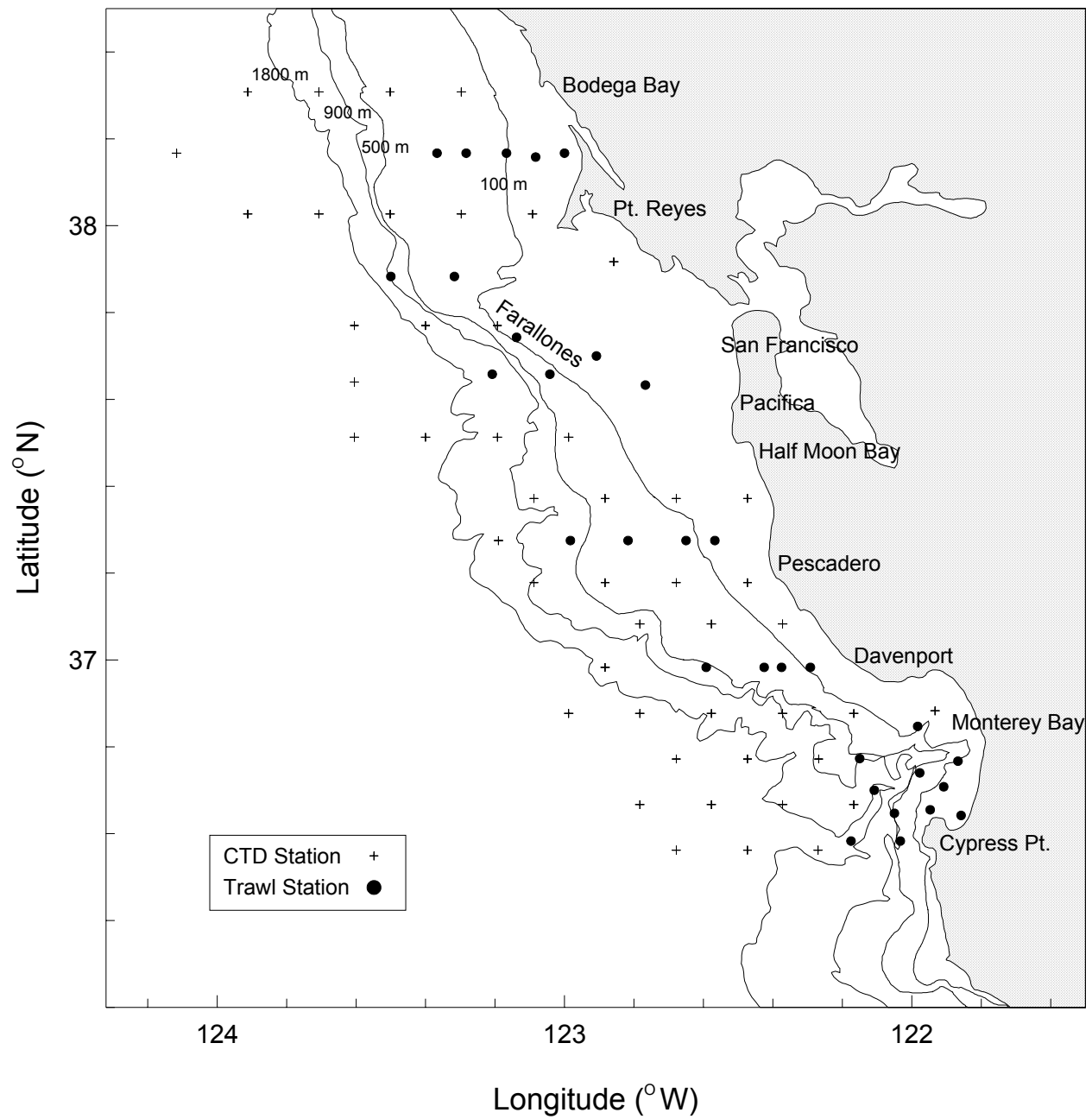


Figure 1. Standard Sampling Stations for the Juvenile Rockfish Survey

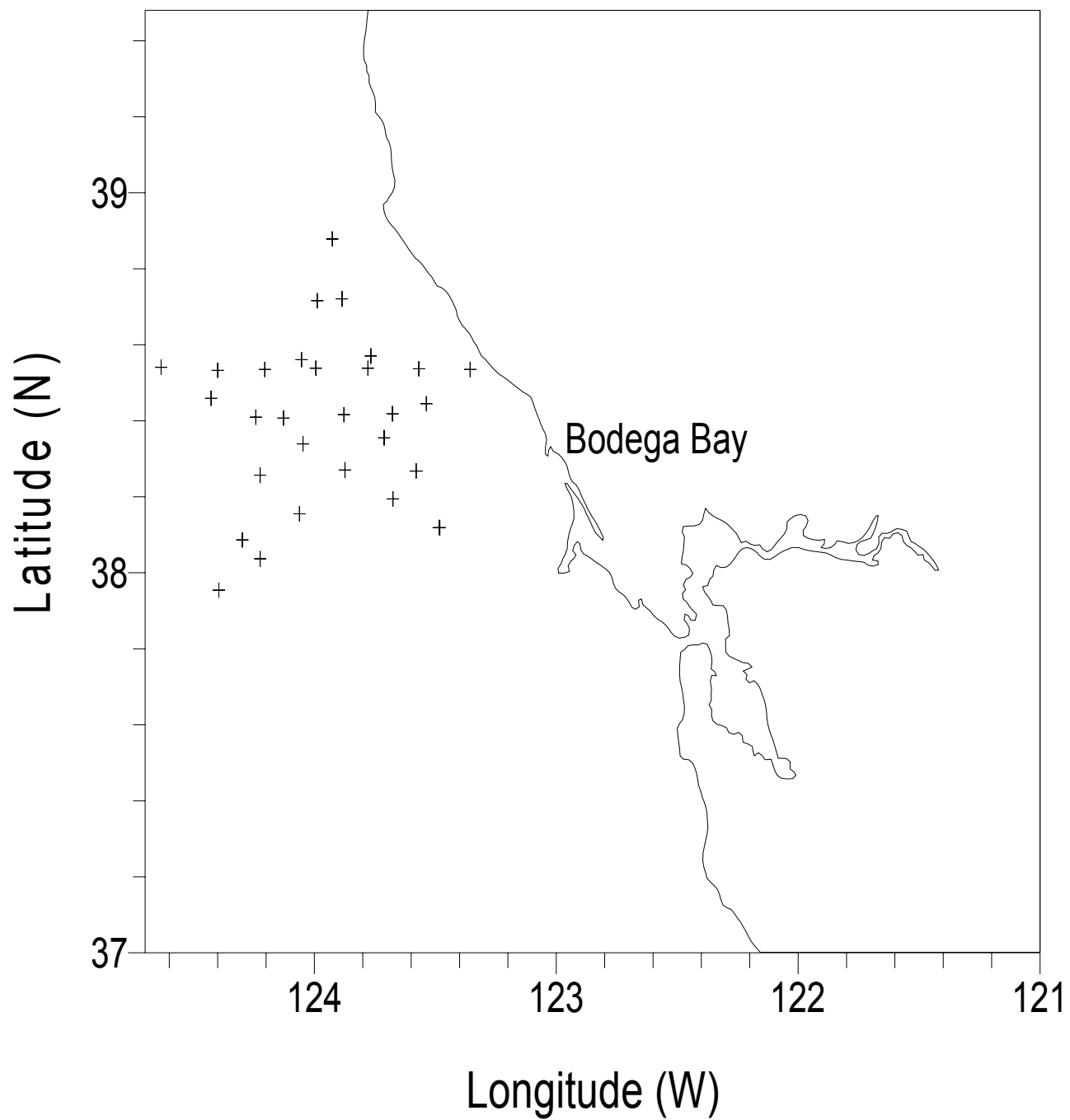


Figure 2. CTD Stations during the Bodega Eddy Survey

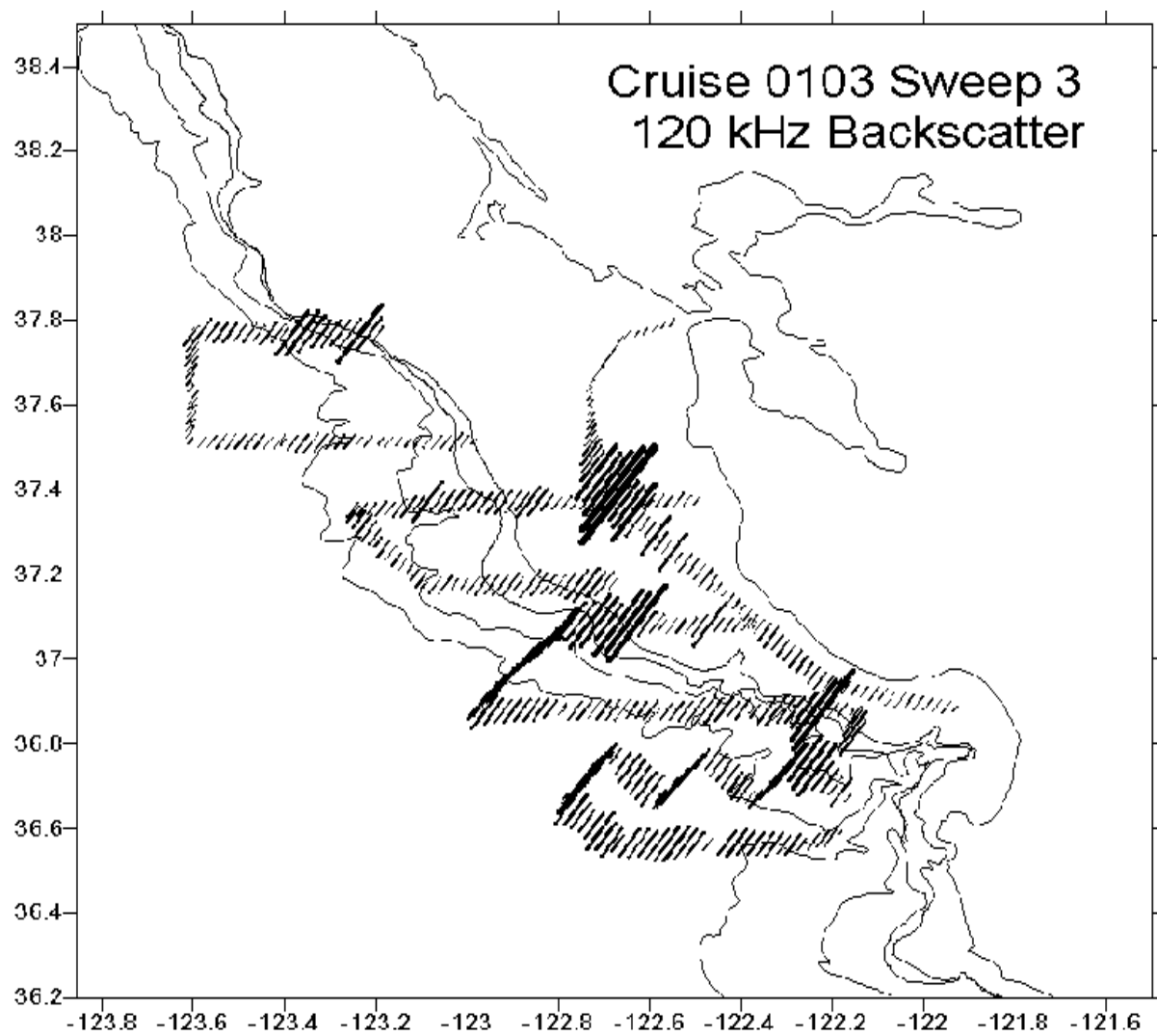


Figure 3. Zooplankton Field from Acoustic Backscatter during Sweep 3

Table 1. Number of pelagic young-of-the-year rockfish collected by midwater trawl at standard stations during May-June cruises (1986-2001)

SPECIES	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	01
Shortbelly	9104	6865	107962	1598	4479	2422	2838	2287	949	276	1848	784	69	124	2016	3403
Chilipepper	54	586	4418	24	66	343	90	1251	3	32	17	12	3	27	27	126
Brown	470	10	-	3	19	265	7	1226	15	5	32	2	-	2	5	117
Widow	11	424	257	13	296	623	1	101	24	25	-	49	1	81	80	193
Squarespot	4	177	380	16	649	47	70	25	2	-	-	1	-	-	-	36
Canary	46	71	162	39	23	618	-	14	3	-	-	3	-	38	9	31
Blue	4	196	366	63	38	220	3	38	11	7	4	5	-	9	10	67
Stripetail	2	194	30	6	22	175	5	315	9	6	2	27	14	31	11	185
Bocaccio	327	106	60	22	44	114	5	26	4	3	1	7	1	15	24	51
Yellowtail	22	85	69	31	27	281	5	31	8	27	3	6	6	1	10	30
Copper complex	9	9	1	-	1	15	116	82	54	7	10	42	4	2	4	25
Halfbanded	1	9	-	2	77	8	1	5	2	-	6	68	-	1	-	96
Pygmy	2	15	9	12	10	62	8	2	3	-	1	2	-	1	3	34
Black	1	22	19	5	4	34	-	6	2	7	7	-	1	5	1	2
Olive	-	4	2	6	18	-	-	6	1	-	-	-	-	-	-	13
Darkblotched	-	7	5	-	1	9	-	9	-	2	-	-	-	2	1	1
Cowcod	1	17	1	1	-	-	5	5	-	-	-	-	-	-	-	-
Bank	-	18	4	-	-	-	-	5	-	-	-	-	-	-	1	1
Sebastomus	2	7	3	-	1	3	8	-	-	1	2	27	-	-	2	2
Splitnose	1	4	-	-	1	-	19	-	-	-	-	10	-	1	3	-
Puget Sound	-	-	-	-	-	18	-	-	-	-	-	-	-	-	-	-
Sharpchin	-	-	-	-	-	-	2	-	14	-	-	-	-	1	-	1
Grass	1	1	-	-	-	-	8	2	1	-	-	-	2	-	-	3
Quillback	2	1	-	-	-	6	-	-	2	-	1	-	-	-	-	-
Vermillion	-	4	-	-	1	1	-	-	-	-	-	-	-	-	-	-
Copper	-	-	-	-	-	-	1	-	-	-	6	-	-	-	-	-
Greenspotted	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
Aurora	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-
Unknown	40	5	-	-	2	4	49	31	13	13	31	49	14	25	29	55

Totals	10104	8837	113748	1841	5779	5290	3242	5467	1120	411	1971	1095	115	366	2236	4472
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